

Lightweight Hybrid Ablator Incorporating Aerogel-Filled Open-Cell Foam Structural Insulator, Phase II

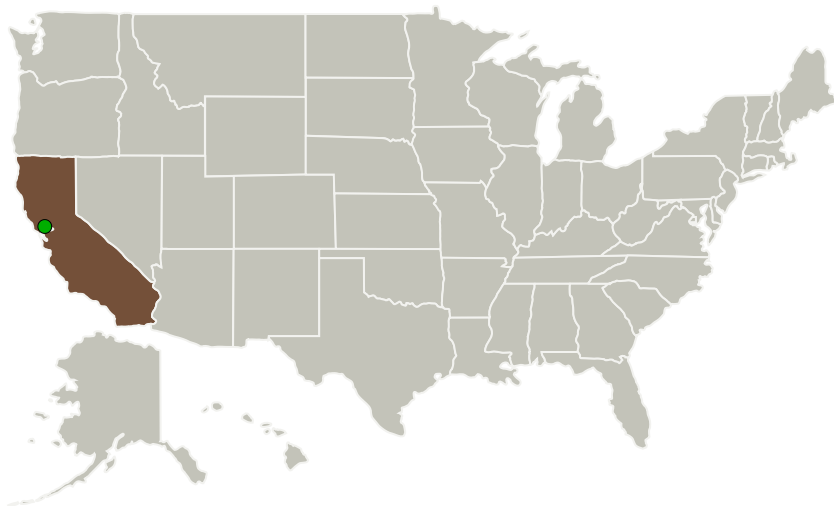
Completed Technology Project (2010 - 2012)



Project Introduction

In previous work for NASA and DoD, Ultramet developed lightweight open-cell foam insulators composed of a carbon or ceramic structural foam skeleton filled with a high temperature nanoscale aerogel insulator. Structural integrity and high insulation behavior have been demonstrated when used in combination with a non-ablating, coated carbon/carbon or ceramic matrix composite outer shell. In Phase I, Ultramet demonstrated the initial feasibility of a foam-reinforced hybrid ablator/aerogel insulator thermal protection system (TPS) in which a portion of the thickness (front face) of a low thermal conductivity structural foam was infiltrated with an ablative material and the remainder of the thickness (back face) was filled with the high temperature aerogel insulator. The potential benefit is a reduction in the ablator mass required to reject the aerothermal heat load. The three-dimensionally interconnected foam reinforcement is anticipated to provide increased char retention relative to alternative fiber and honeycomb reinforcements. The vehicle interface temperature will be controlled by the highly insulating aerogel-filled portion of the foam structure. In Phase II, Ultramet will team with Materials Research & Design (MR&D) for continued thermomechanical design optimization, and ARA Ablatives Laboratory for ablator infiltration of Ultramet structural foam. Performance will be evaluated through high heat flux ablation testing and a demonstration of scaleup potential up to 18" diameter.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Ultramet	Lead Organization	Industry	Pacoima, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

California

Project Transitions

June 2010: Project Start

June 2012: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139153>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Ultramet

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

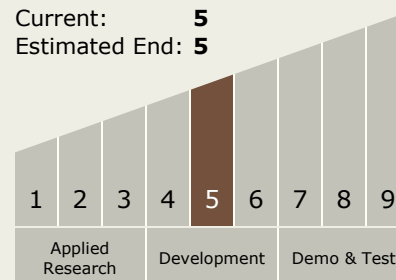
Carlos Torrez

Principal Investigator:

Brian E Williams

Technology Maturity (TRL)

Start: 5
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.4 Insulation and Interfaces

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System